Iowa Department of Transportation

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Iowa DOT Freight Advisory Council Meeting
Project Overview - Freight Transportation Network Optimization Strategy

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consulting & technology

Presenter

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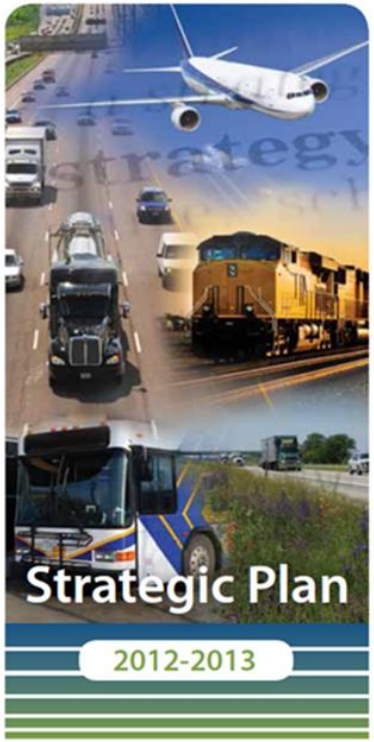
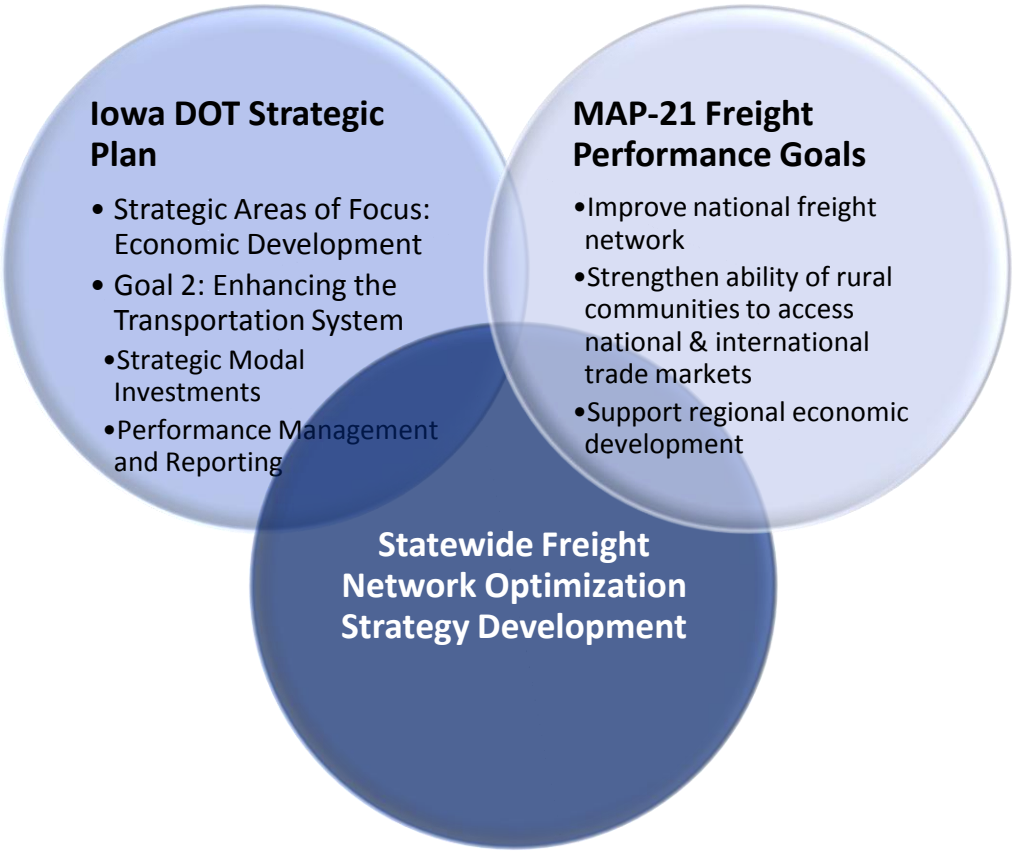
Agenda

- Introduction
- Project Approach
- Freight Flow Data Analysis
- Logistics Cost Data
- Questions & Answers

Project Vision

To effectively identify and prioritize investment opportunities for an optimized freight transportation network to lower transportation costs for Iowa businesses and promote business growth in Iowa.





Project Objectives

- Analyze freight transportation network demand and capacity to identify constraints
- Design optimization strategies based on quantitative and qualitative analysis of costs and benefits
- Prioritize investment opportunities and develop short and long term financial models
- Develop business cases to reduce transportation costs for Iowa businesses
- Document a demand-based, value-driven analysis, design, and prioritization methodology to effectively identify and evaluate investment opportunities specific to Iowa's transportation network optimization

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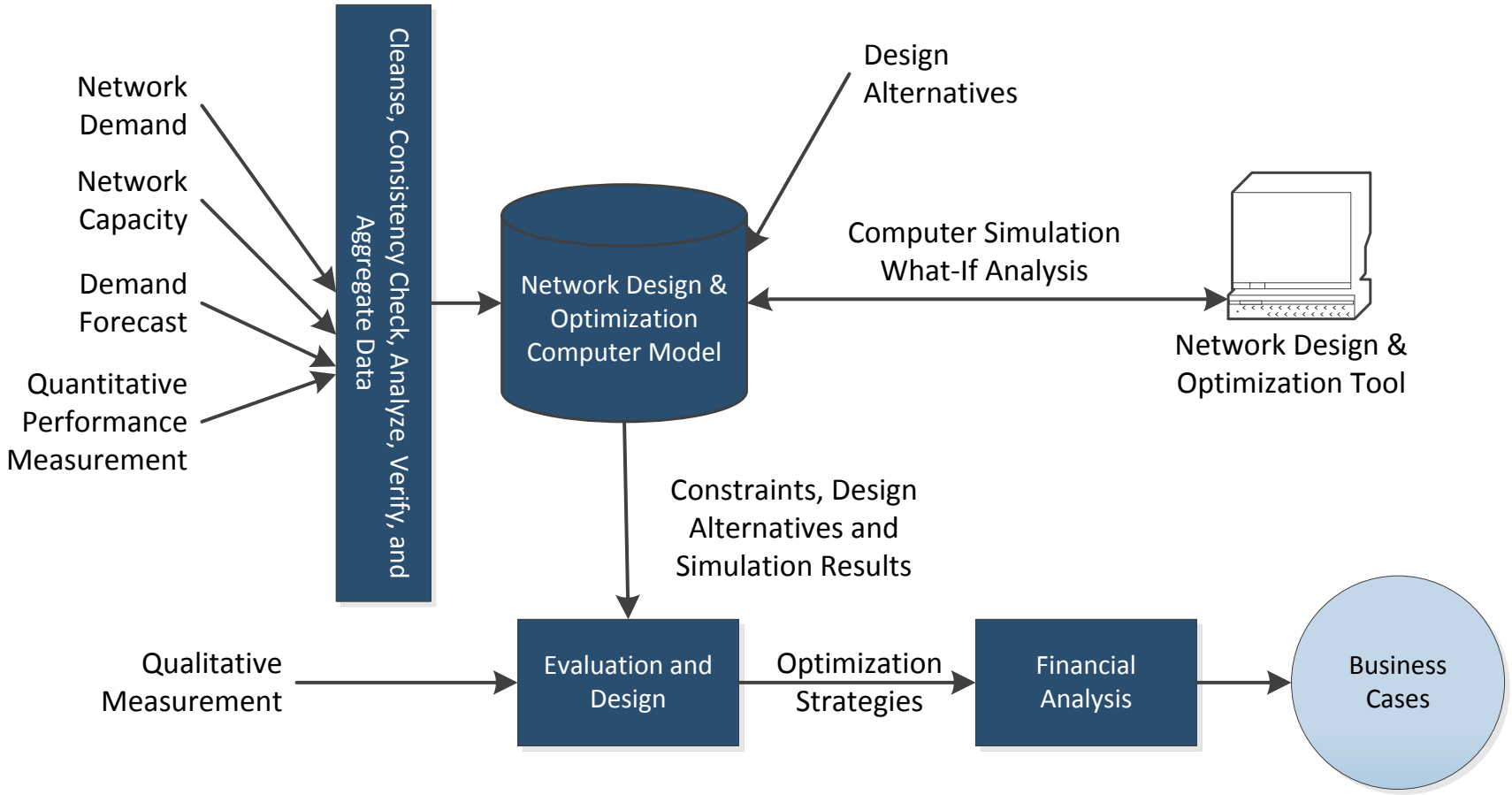
What is demand-based freight network optimization?

- Supply Chain Network
  - Suppliers, plants, warehouses, and flows of products from origin to the final customer
  - 80% of the landed costs are locked in with the location of the facilities and the determination of product flows between them
- Supply Chain Network Design
  - The discipline to determine the optimal location and size of facilities and the flow through the facility network
- Demand-Based Freight Transportation Network Optimization
  - Applies supply chain network design and optimization techniques to freight transportation network
  - Focuses on end users' transportation demand
  - Identifies opportunities to use lower cost transportation modes and additional infrastructure elements to enable lower cost routes

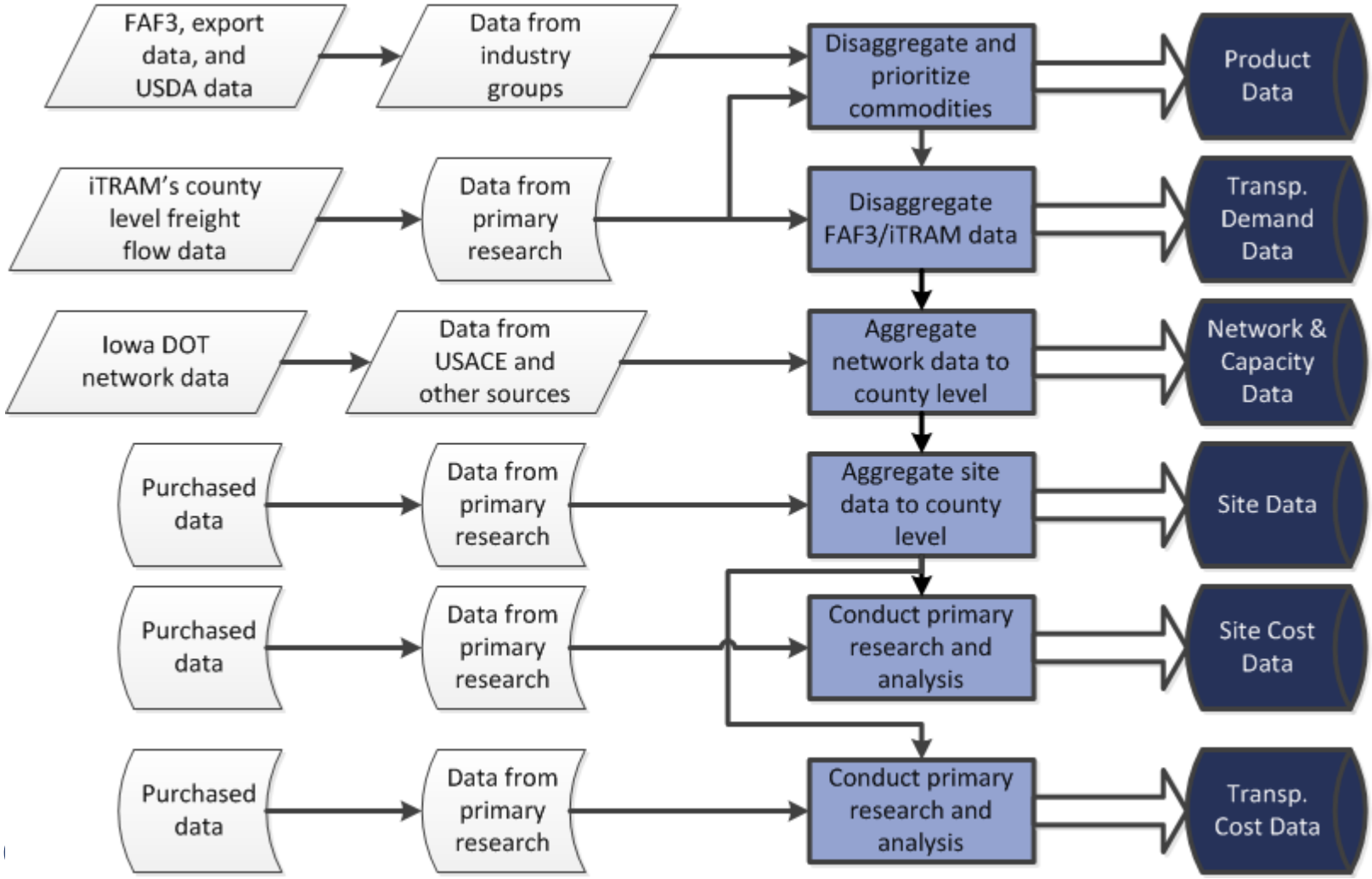
Project Approach

Analysis of Network Demand and Capacity	• Identification and prioritization of demand areas • Analyze network demand and capacity
Performance Measurement and Constraints Analysis	• Use quantitative and qualitative measurements • Identify and prioritize current and forecasted network performance constraints
Creating and Prioritizing Optimization Strategies	• Develop pragmatic short-term and long-term optimization strategies • Does not intend to identify and evaluate all optimization strategies
Business Case Development	• Conduct financial analysis and develop financial models • Develop actionable recommendations with justifications

Project Approach



Data Strategy



Optimization Analysis & Expected Results

- Optimization Analysis
  - Quantitative Analysis
    - Cost, lead time requirement, capacity, etc.
  - Qualitative Analysis
    - Strategic investment directions
    - Environmental impact (carbon footprint and road mile reduction)
    - Freight network redundancy
    - Tax incentive / funding availability
    - Public relations
- Expected Results
  - Baseline Optimization – how do we best use the current freight network to deliver optimized results?
    - Identifies alternative routes, alternative modes, etc. in current network
  - Greenfield Scenario Analysis – what are the infrastructure elements to develop and where should they be located to optimize the network?
    - Identifies new intermodal facilities, commodity consolidation points, rail and barge terminals, roadways, rail lines, etc.

Advantages of the Methodology

- Holistic analysis of the entire network
  - Vs. examining point solutions
- Analyzing the true cost-saving opportunities to the producers
  - Vs. increasing network capacity that may help local businesses
- Prioritizing investment based on ranking of ROI and other measurement criteria
  - Vs. justifying investment case by case
- Development of reusable framework for future studies
- Specific and actionable recommendations

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Freight Flow Data – FAF3

- FAF3 dataset from Federal Highway Administration
  - Developed based on data from 2007 Commodity Flow Survey by a partnership between Census Bureau and The Bureau of Transportation Statistics
  - Includes base year (2007) and 2015 through 2040 estimated data
  - 123 domestic regions, 8 foreign regions (Iowa is one zone)
  - 7 modes
  - Includes estimated tonnage and domestics ton-miles
  - Includes 43 commodity codes

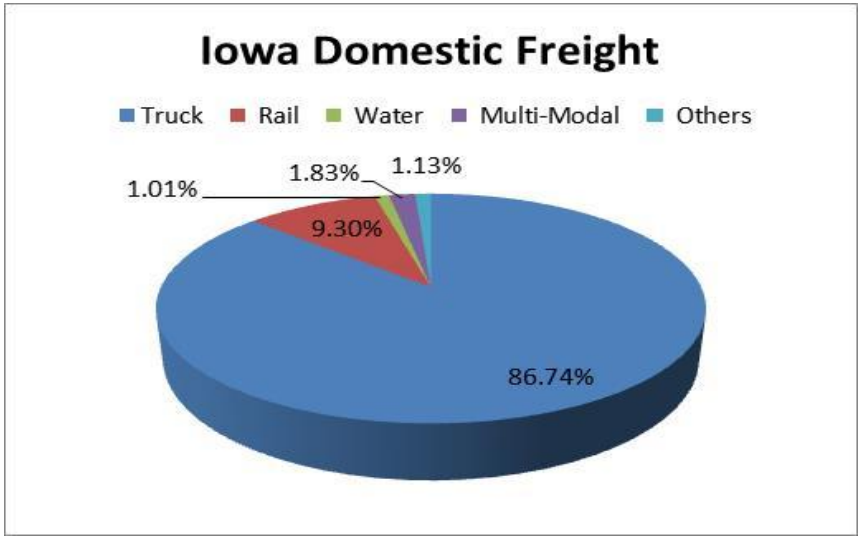
Code	Description	Code	Description	Code	Description	Code	Description
01	Live animals/fish	12	Gravel	23	Chemical prods.	34	Machinery
02	Cereal grains	13	Nonmetallic minerals	24	Plastics/rubber	35	Electronics
03	Other ag prods.	14	Metallic ores	25	Logs	36	Motorized vehicles
04	Animal feed	15	Coal	26	Wood prods.	37	Transport equip.
05	Meat/seafood	16	Crude petroleum	27	Newsprint/paper	38	Precision instruments
06	Milled grain prods.	17	Gasoline	28	Paper articles	39	Furniture
07	Other foodstuffs	18	Fuel oils	29	Printed prods.	40	Misc. mfg. prods.
08	Alcoholic beverages	19	Coal-n.e.c.	30	Textiles/leather	41	Waste/scrap
09	Tobacco prods.	20	Basic chemicals	31	Nonmetal min. prods.	43	Mixed freight
10	Building stone	21	Pharmaceuticals	32	Base metals	99	Unknown
11	Natural sands	22	Fertilizers	33	Articles-base metal		

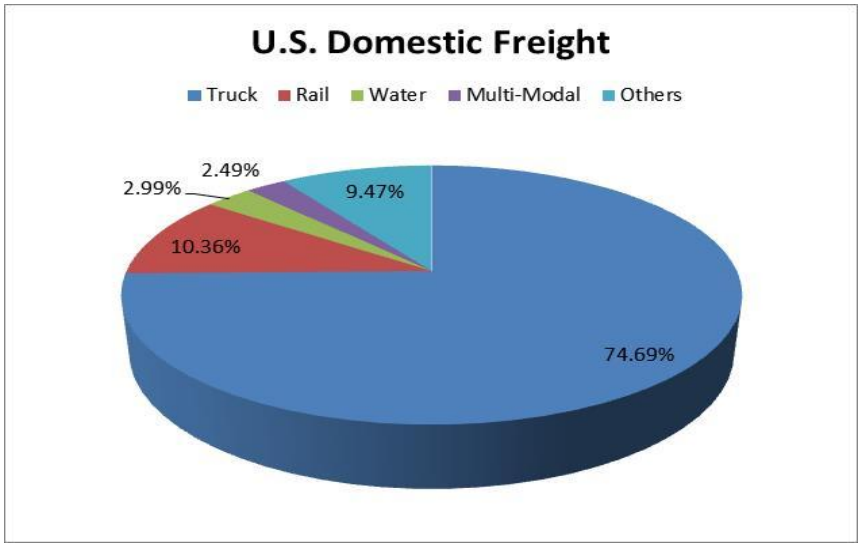
Freight Flow Data - iTRAM

- FAF3 freight flow data is disaggregated based on socio-economic data
  - 43 commodity codes
  - 3,143 counties to 3,143 counties O-D (Origin-Destination) pairs in U.S.
  - 3,143 U.S. counties to 8 international regions
    - Canada, Mexico, Rest of Americas, Europe, Africa, SW & Central Asia, Eastern Asia, and SE Asia & Oceania
  - 4 modes: truck, rail, water, multimodal

Freight Flow Data – Network Optimization

- iTRAM freight flow data is disaggregated based on socio-economic data
  - Disaggregate commodities such as 03 – other agriculture products, 07 – other food stuff, 08 – alcoholic beverages, etc.
  - 99 Iowa counties to 3,143 counties O-D pairs in U.S.
  - 99 U.S. counties to top 25 export countries/regions
  - 4 modes: truck, rail, water, multimodal





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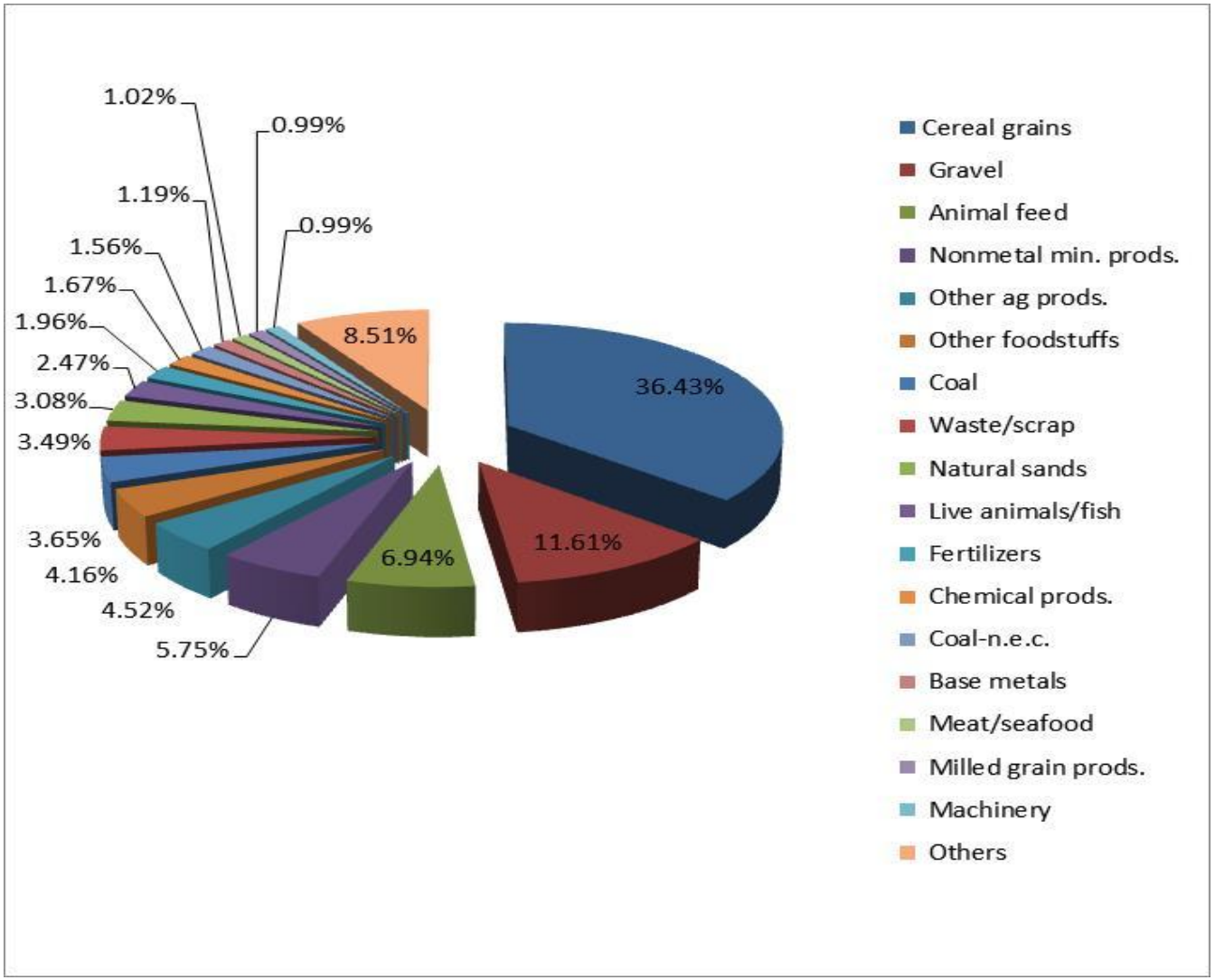
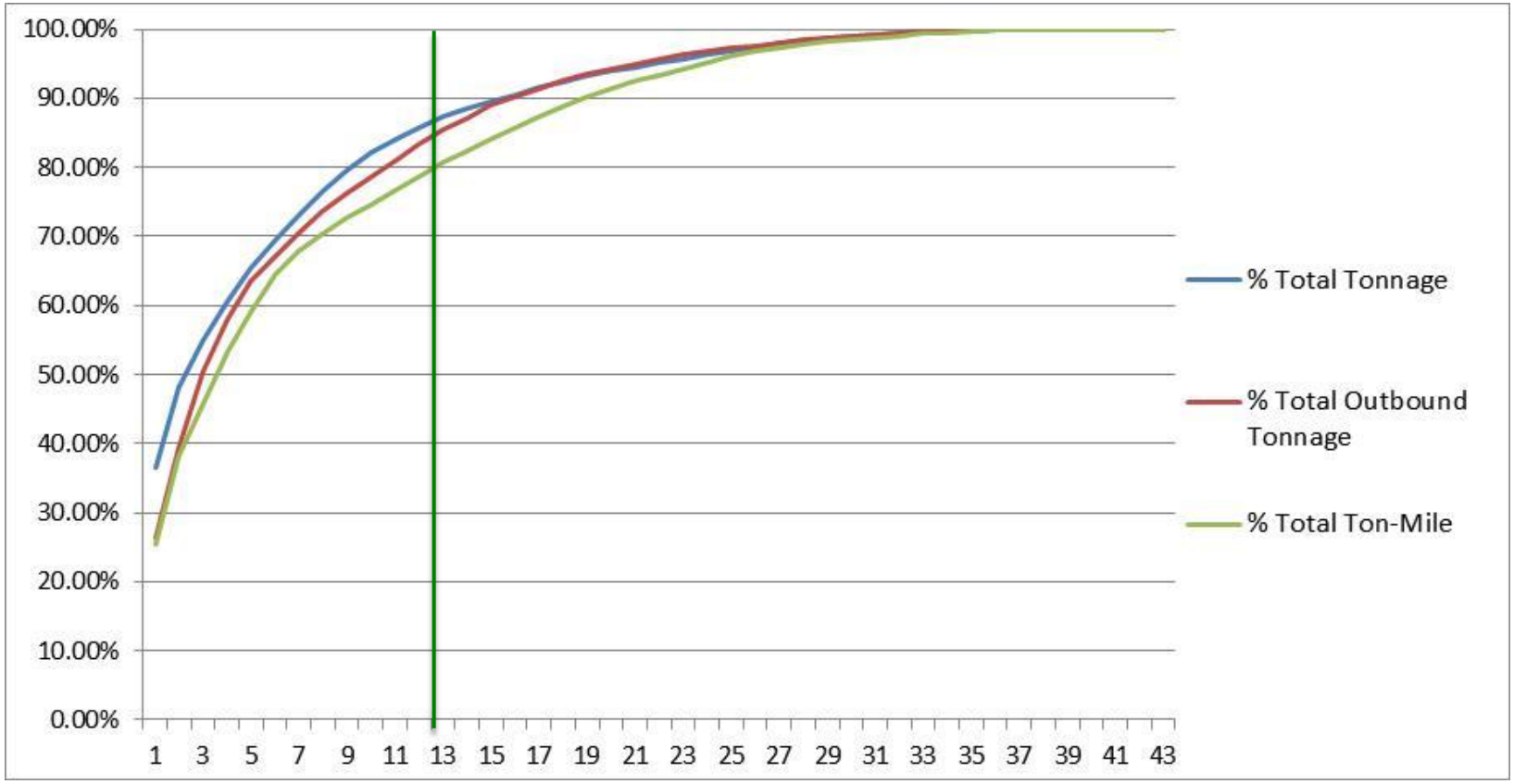
Iowa Commodity Flow by Tonnage



Iowa Commodity Flow



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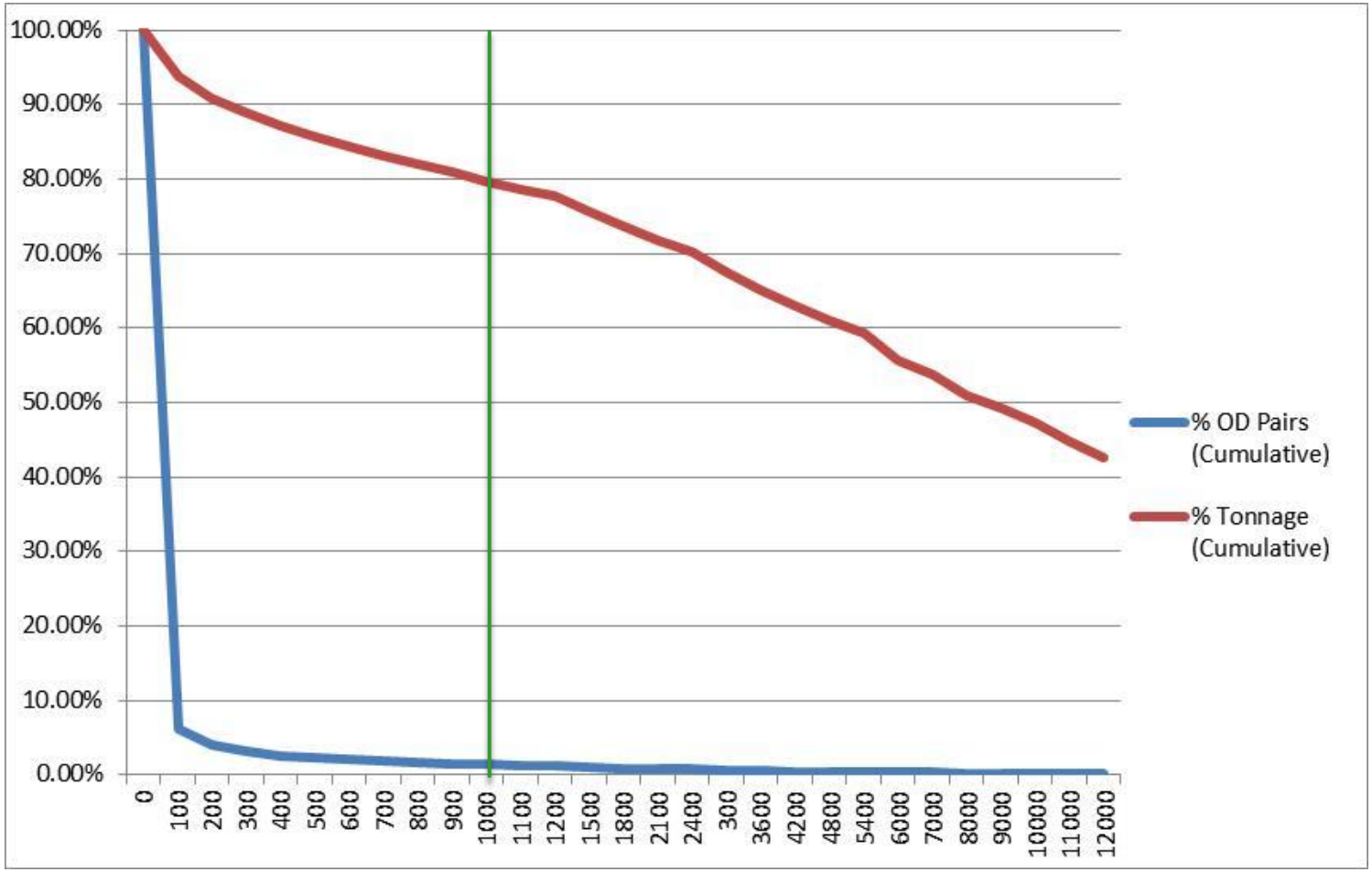
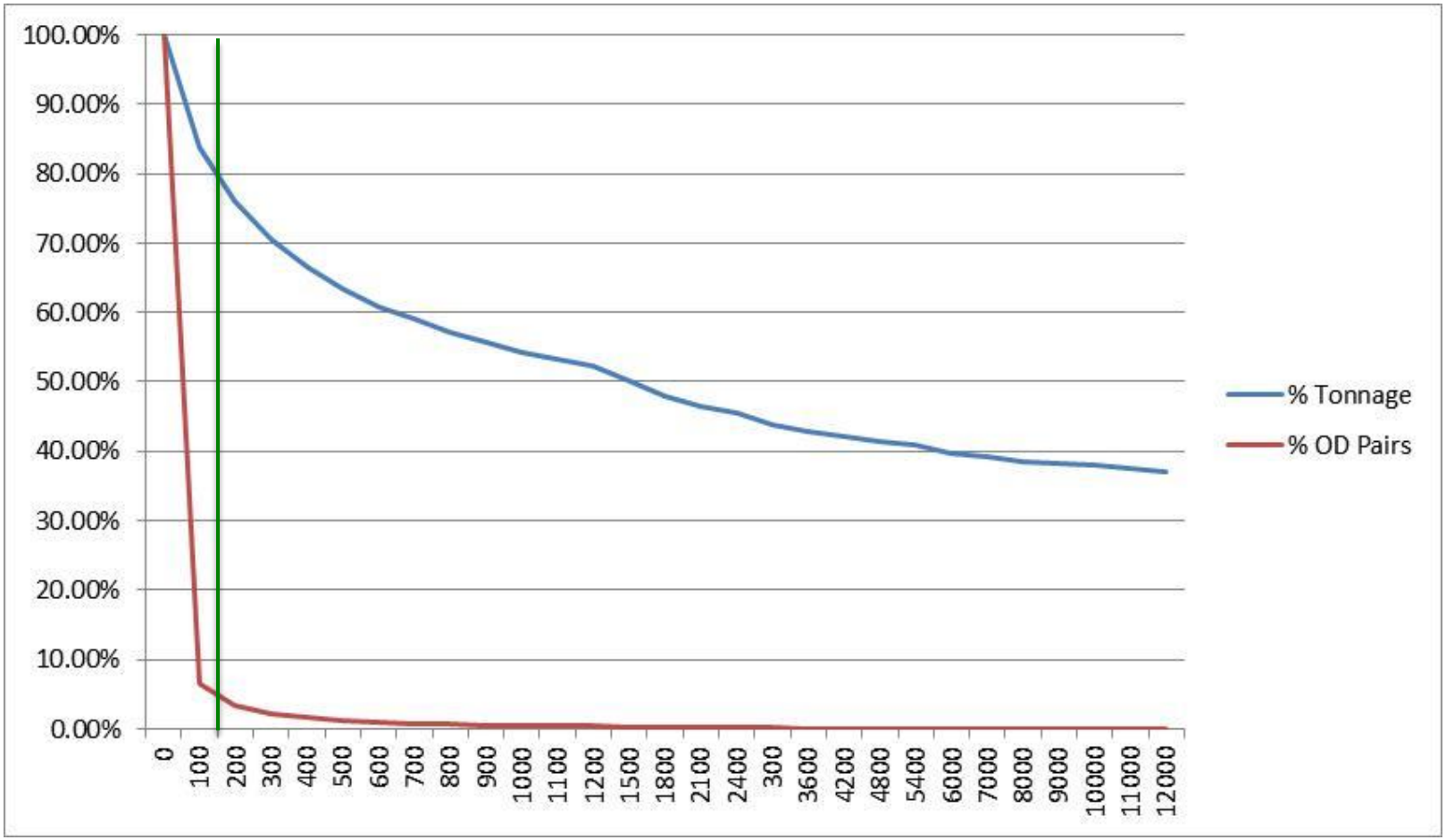
Truck Volume Distribution Over O-D Pairs



Rail Volume Distribution Over O-D Pairs



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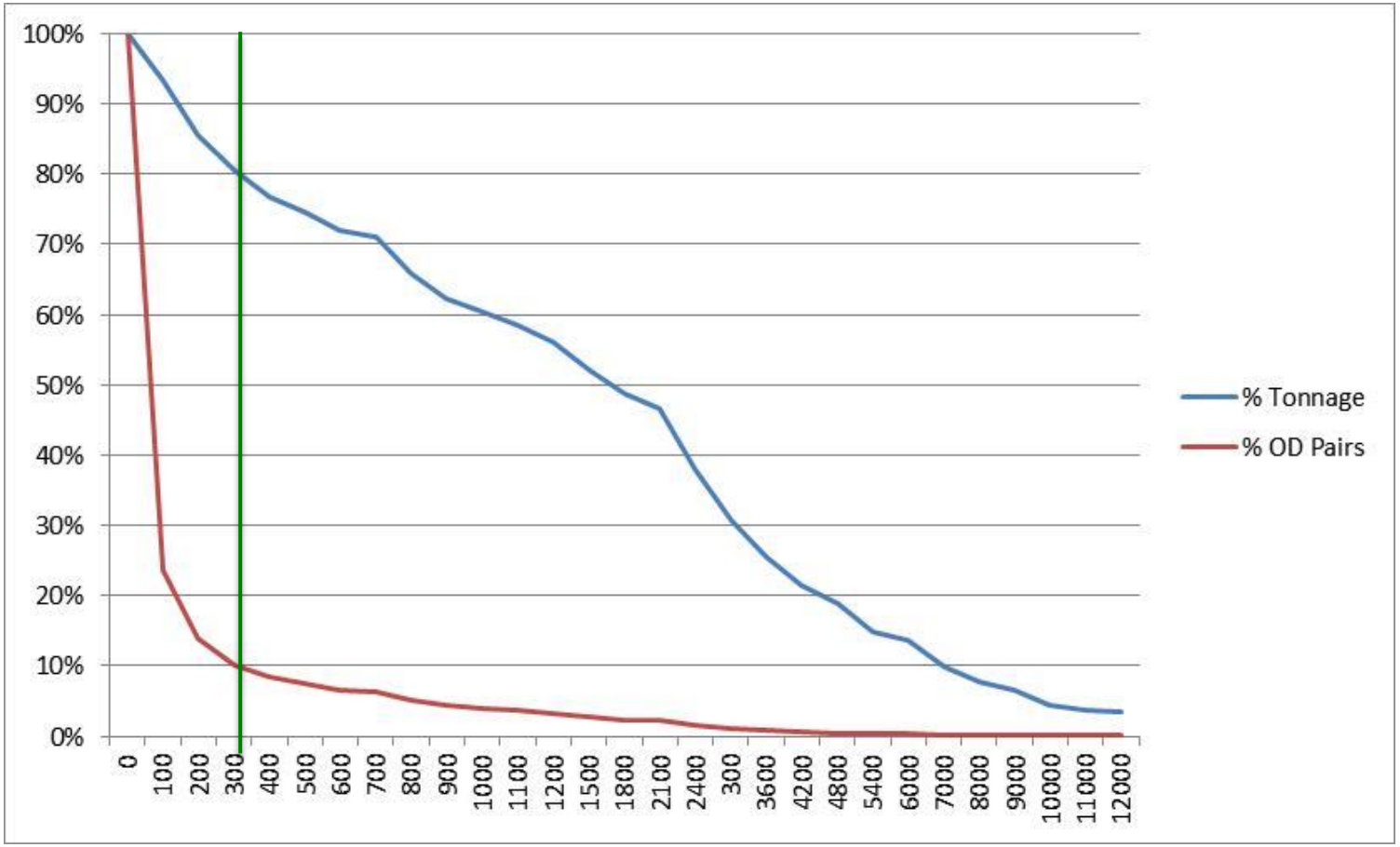
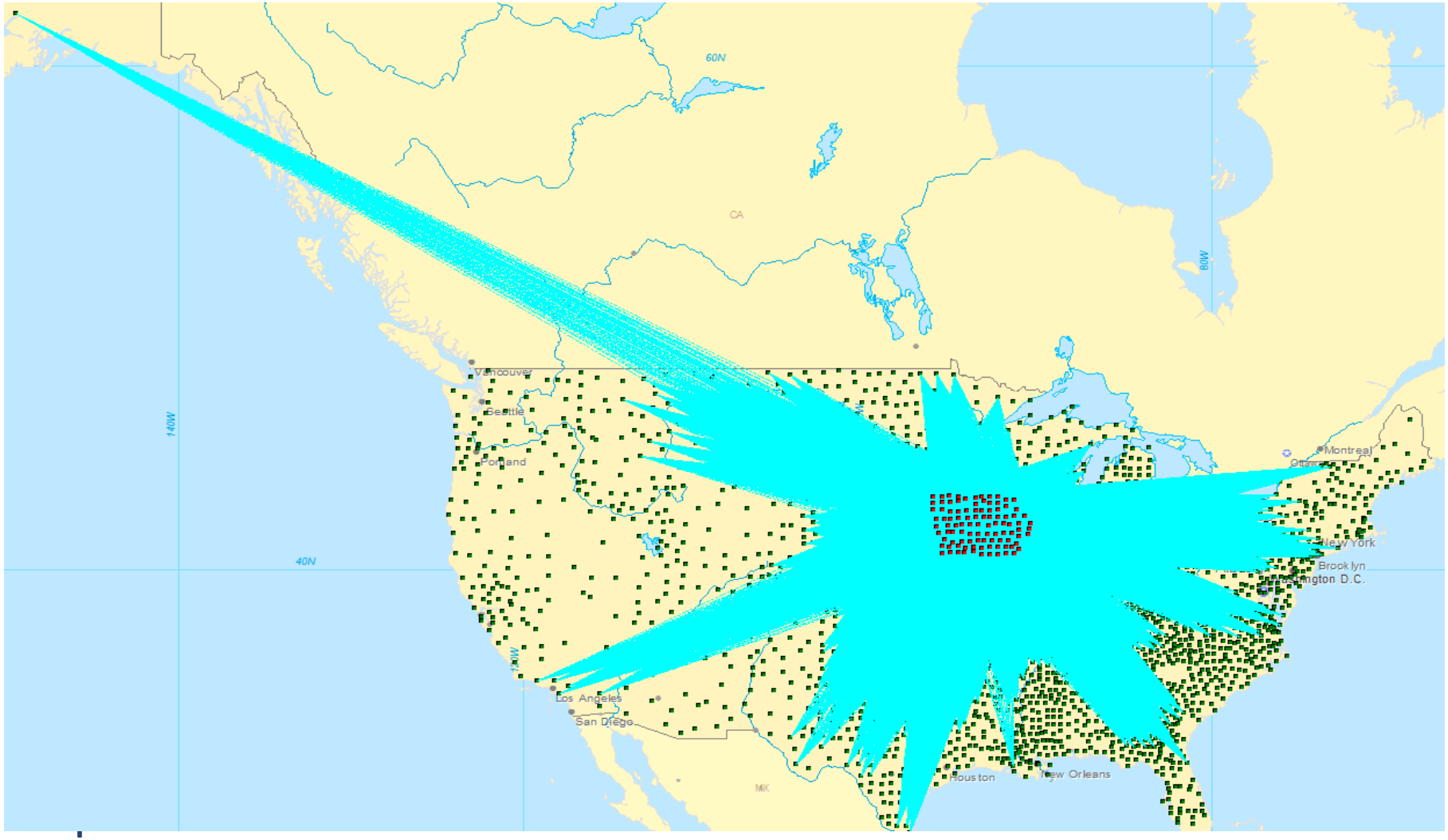
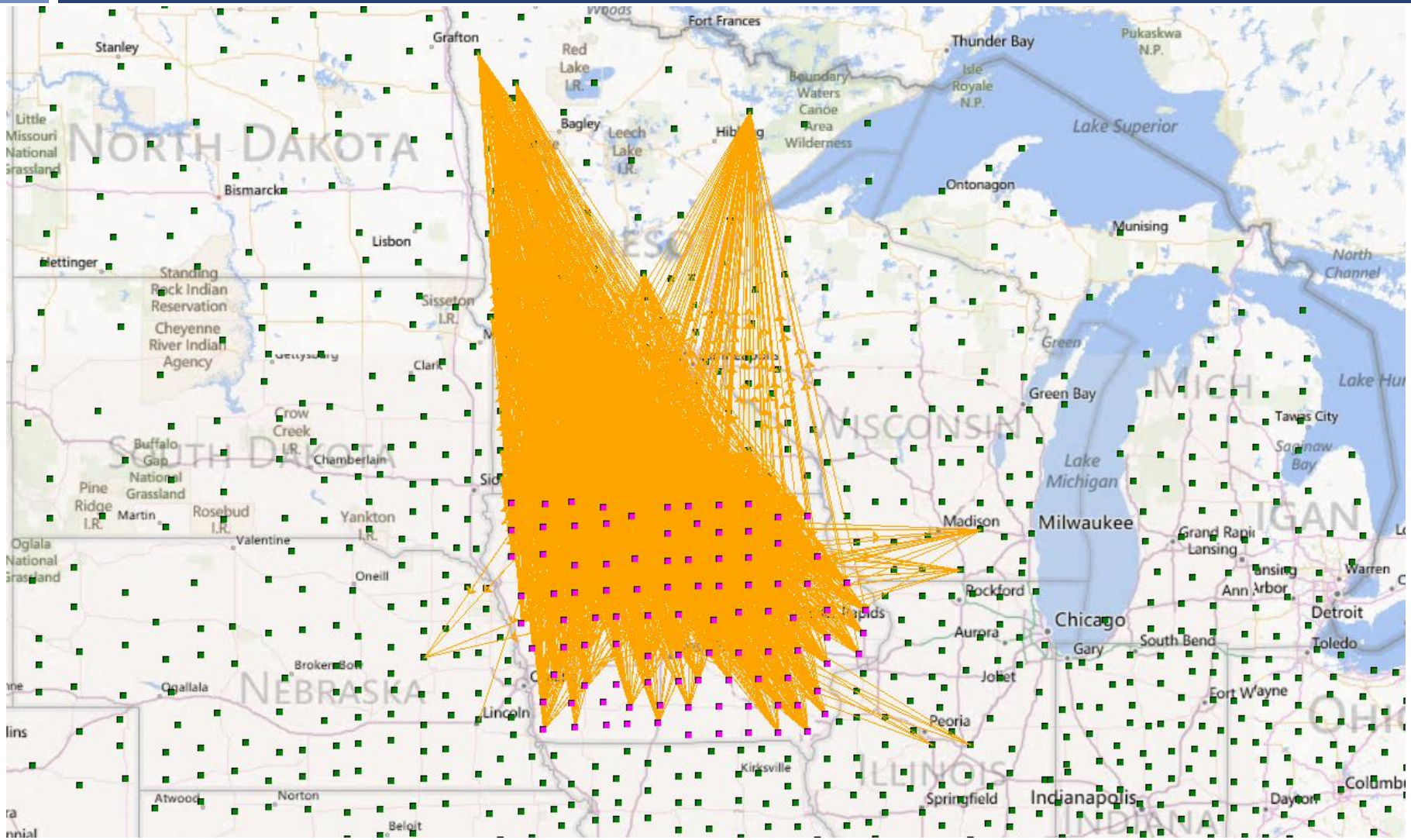
Water Volume Distribution Over O-D Pairs



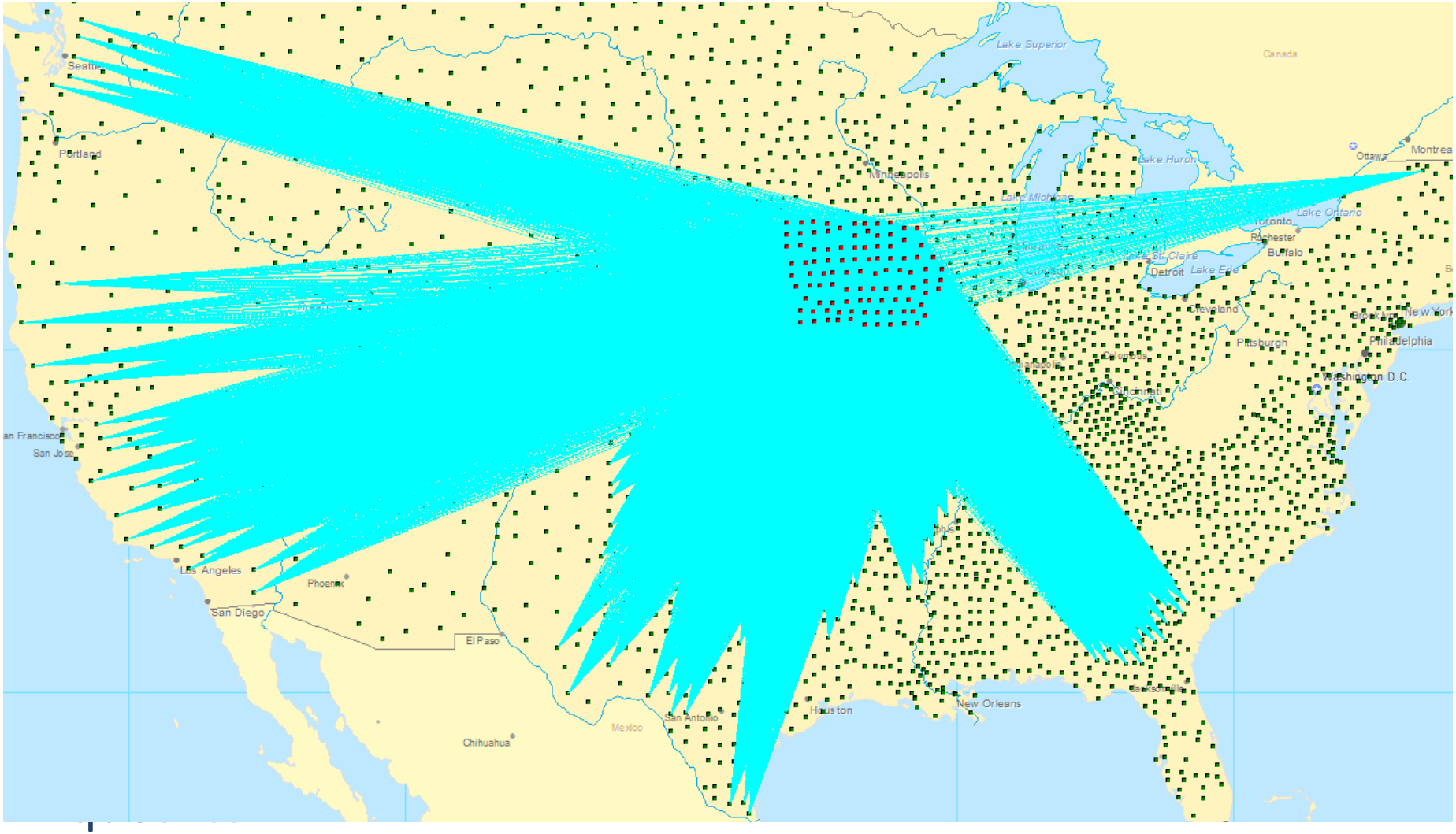
Cereal Grains – Outbound – Truck – Original



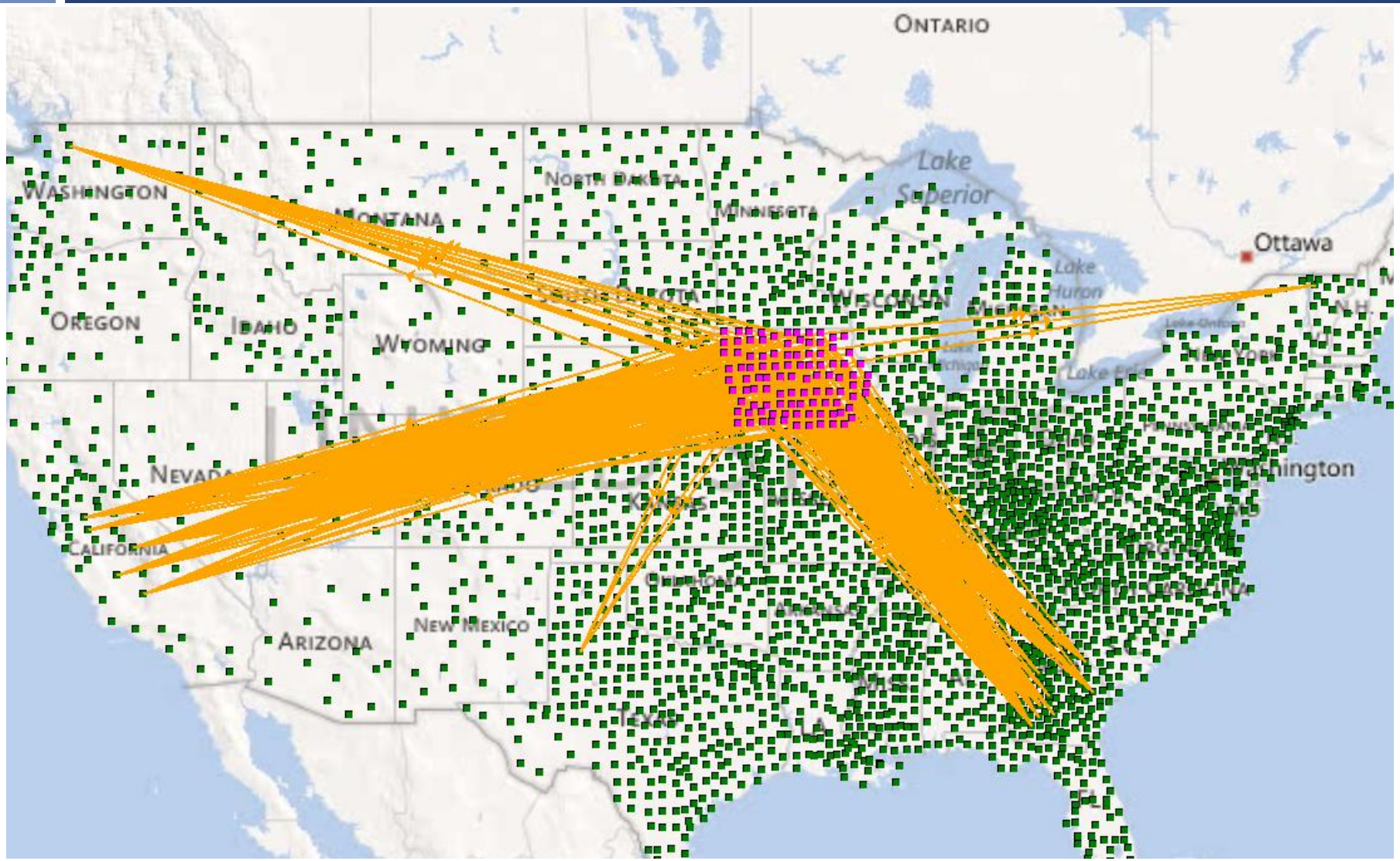
Cereal Grains – Outbound – Truck - Filtered



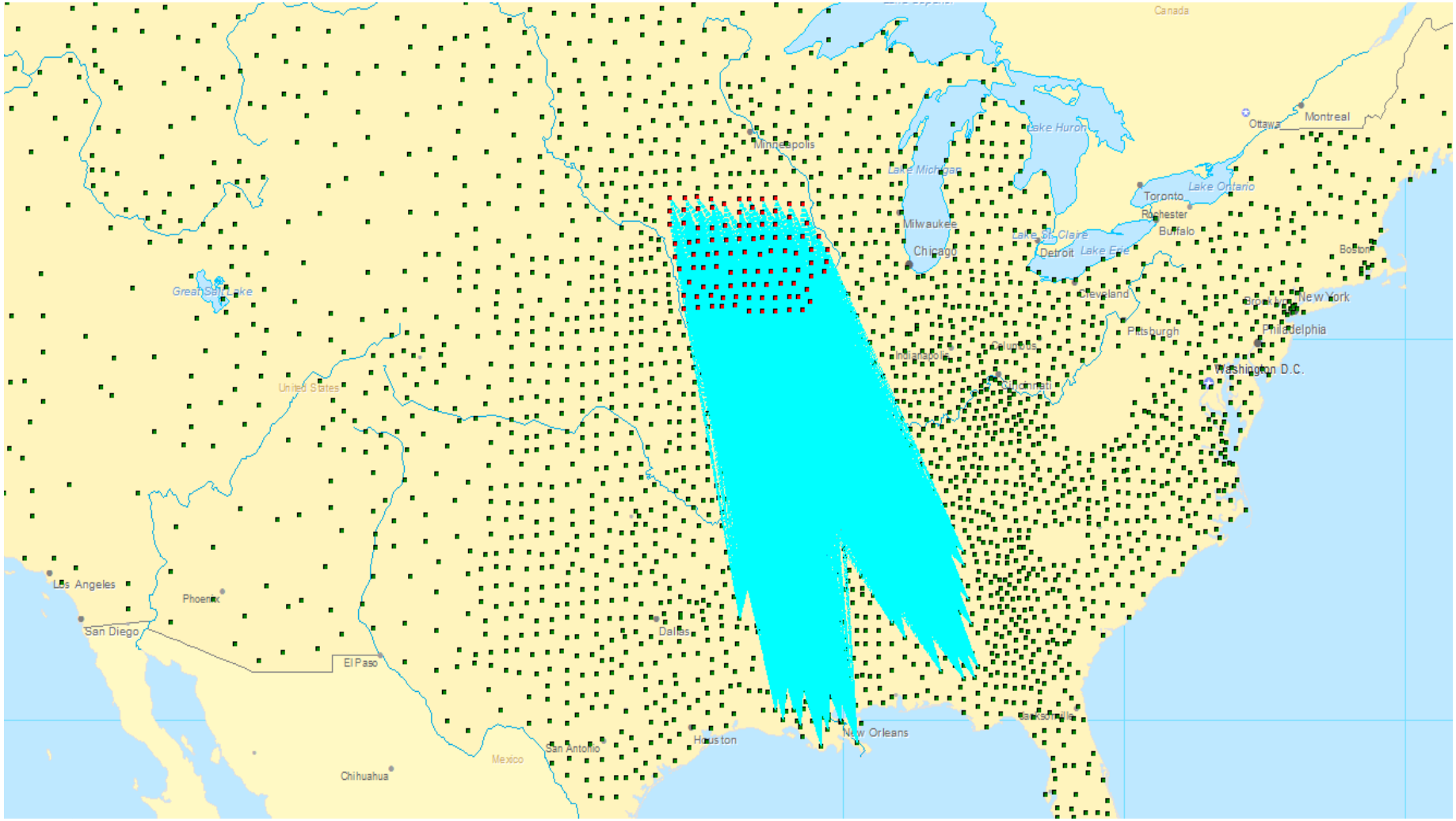
Cereal Grains – Outbound – Rail – Original



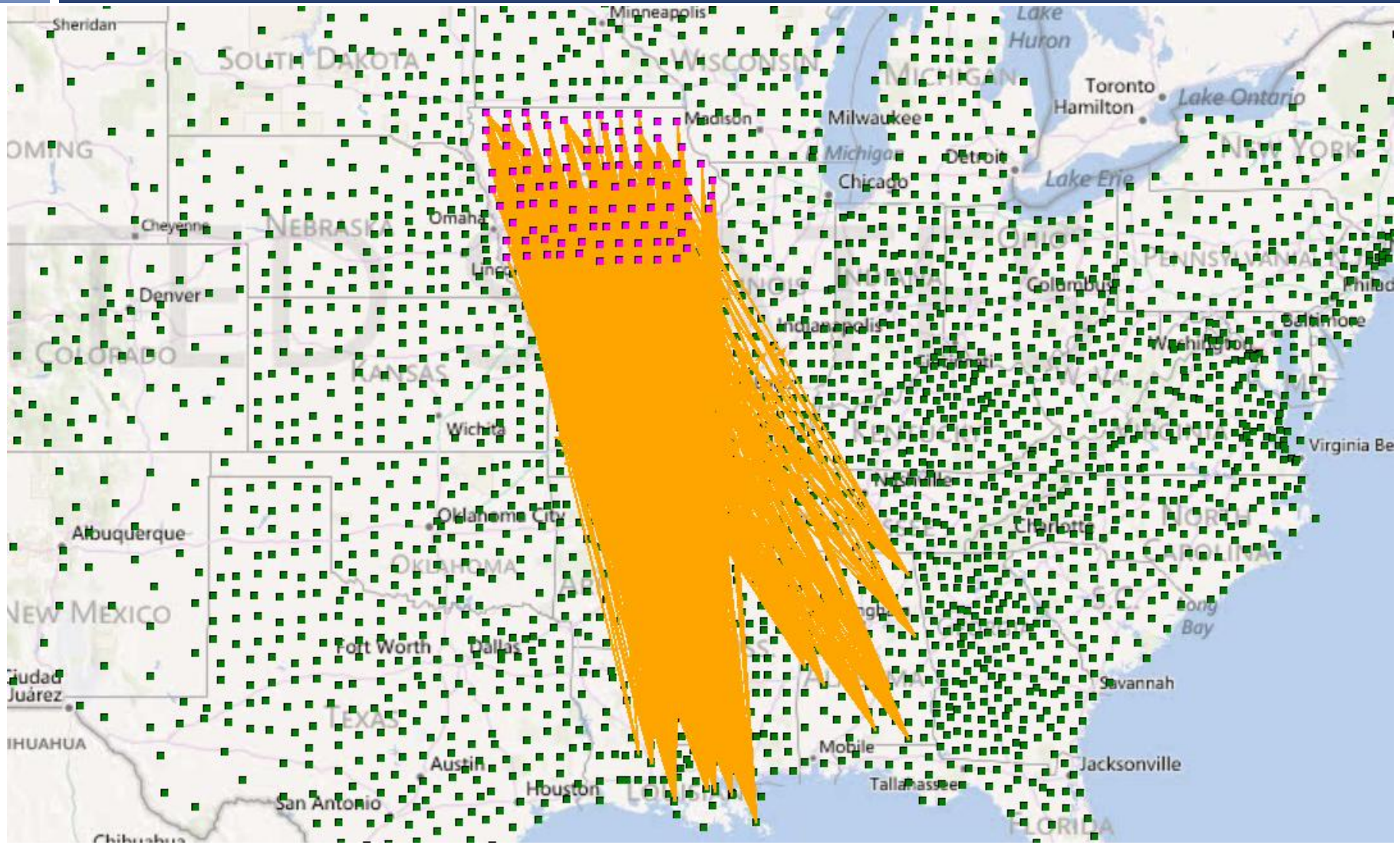
Cereal Grains – Outbound – Rail - Filtered



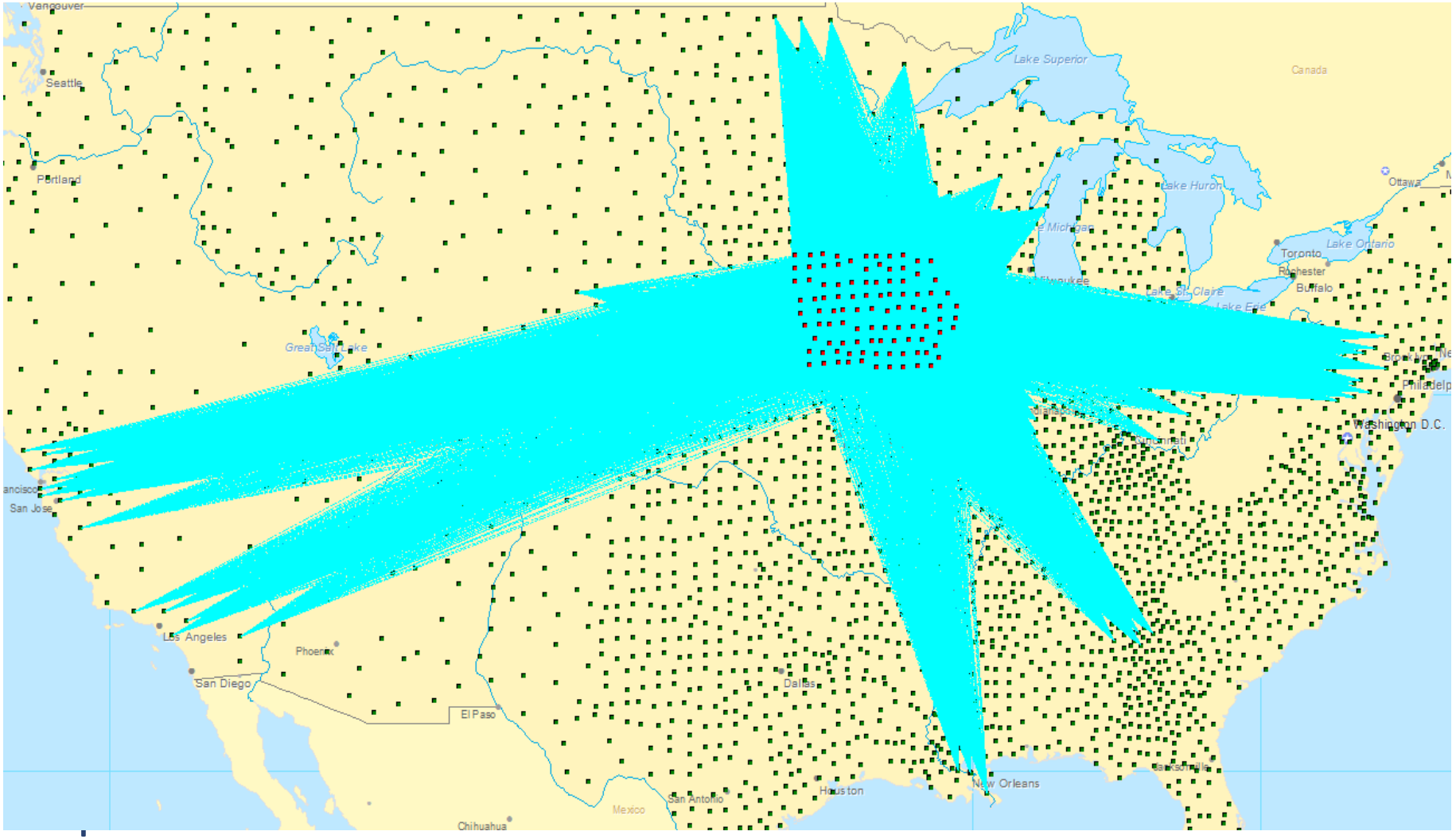
Cereal Grains – Outbound – Water – Original



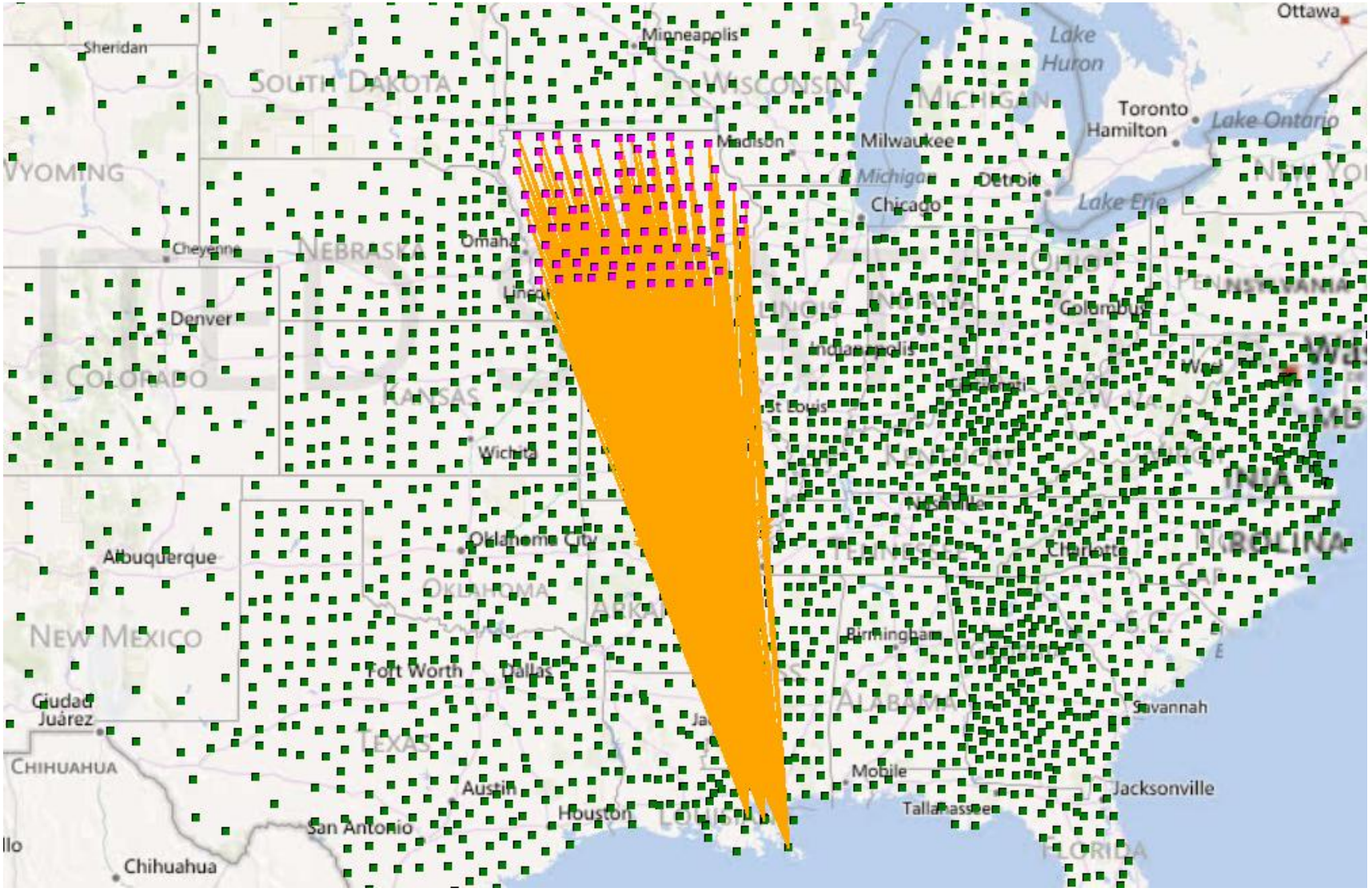
Cereal Grains – Outbound – Water – Filtered



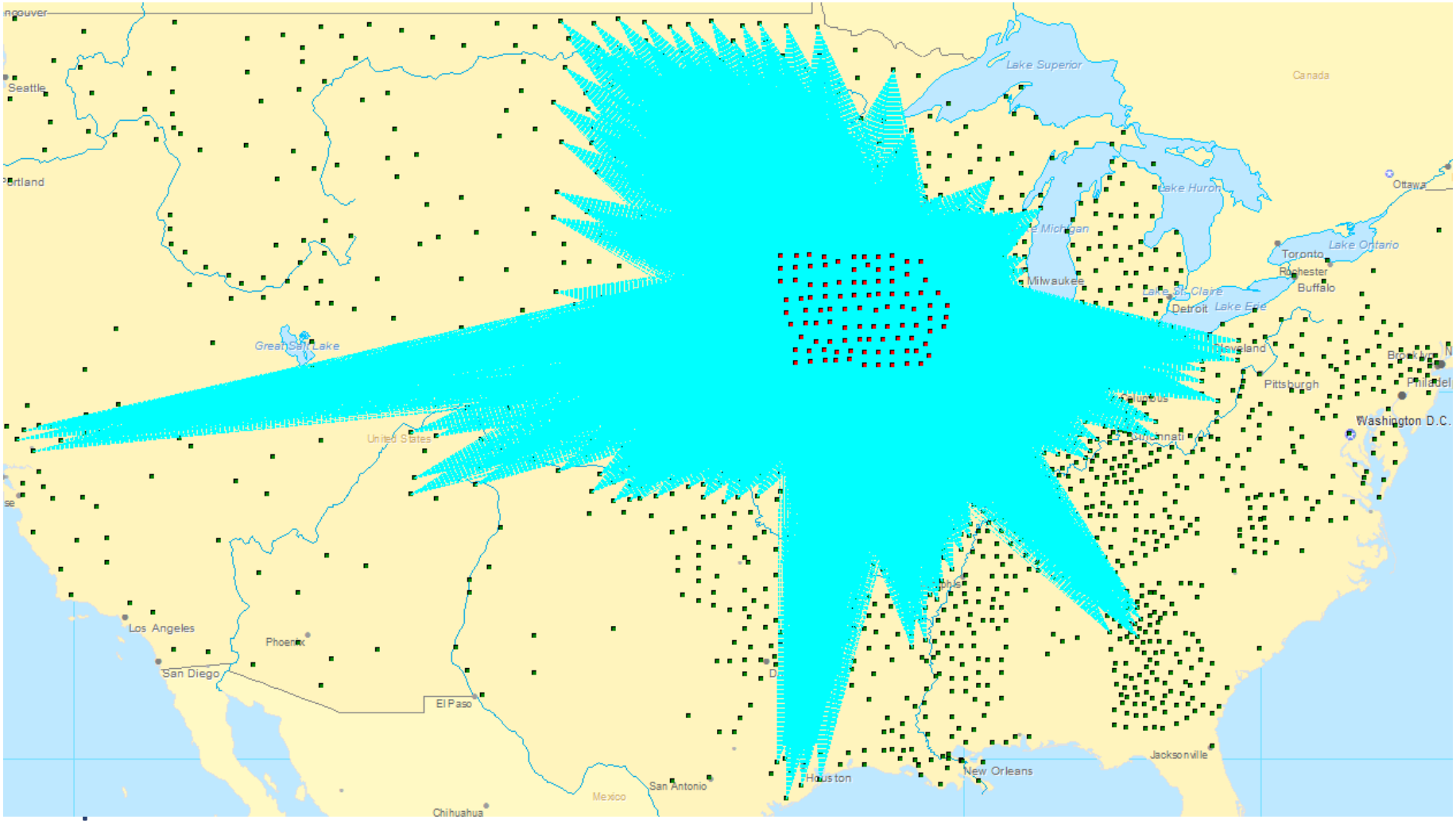
Cereal Grains – Outbound – Multimodal – Original



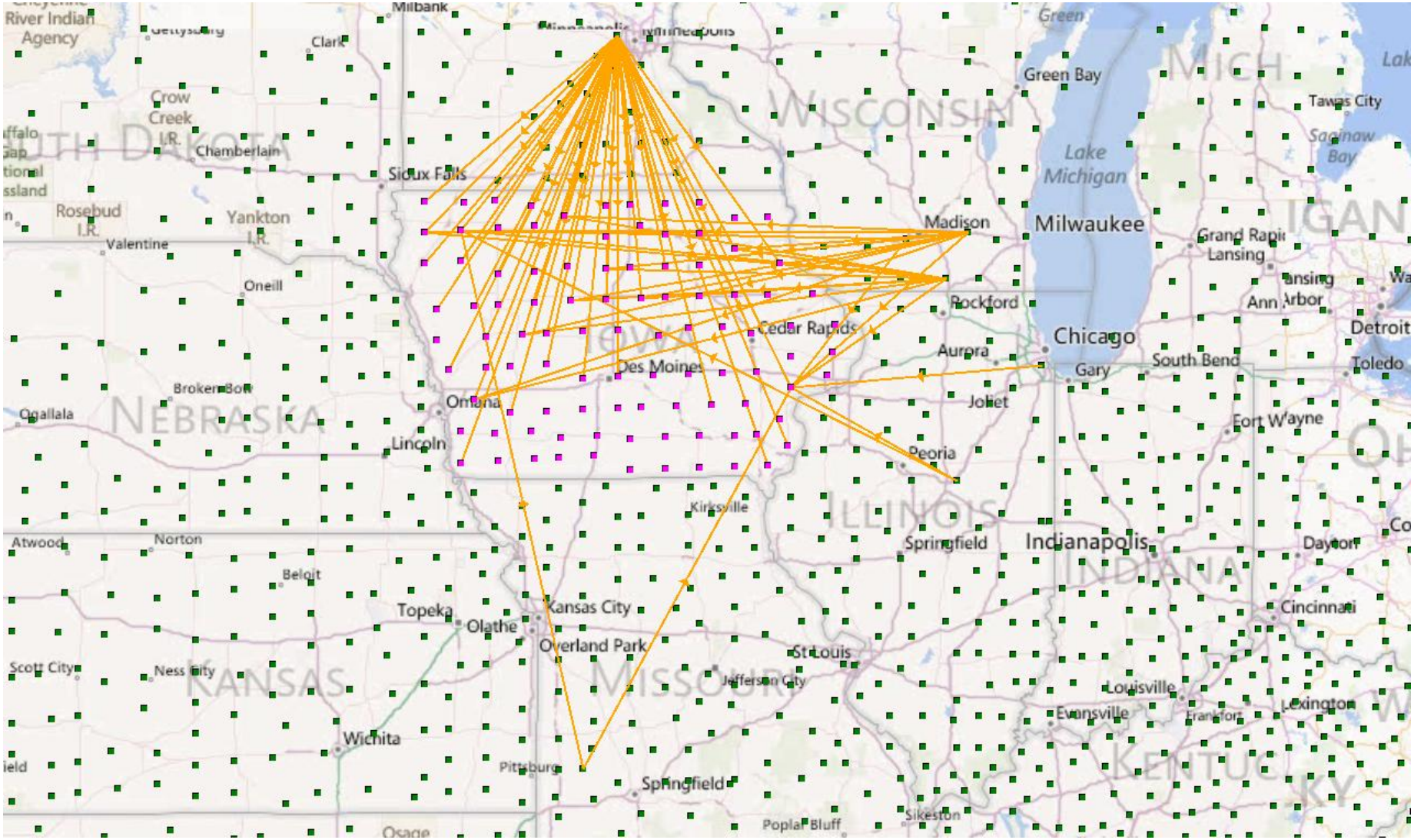
Cereal Grains – Outbound – Multimodal – Filtered



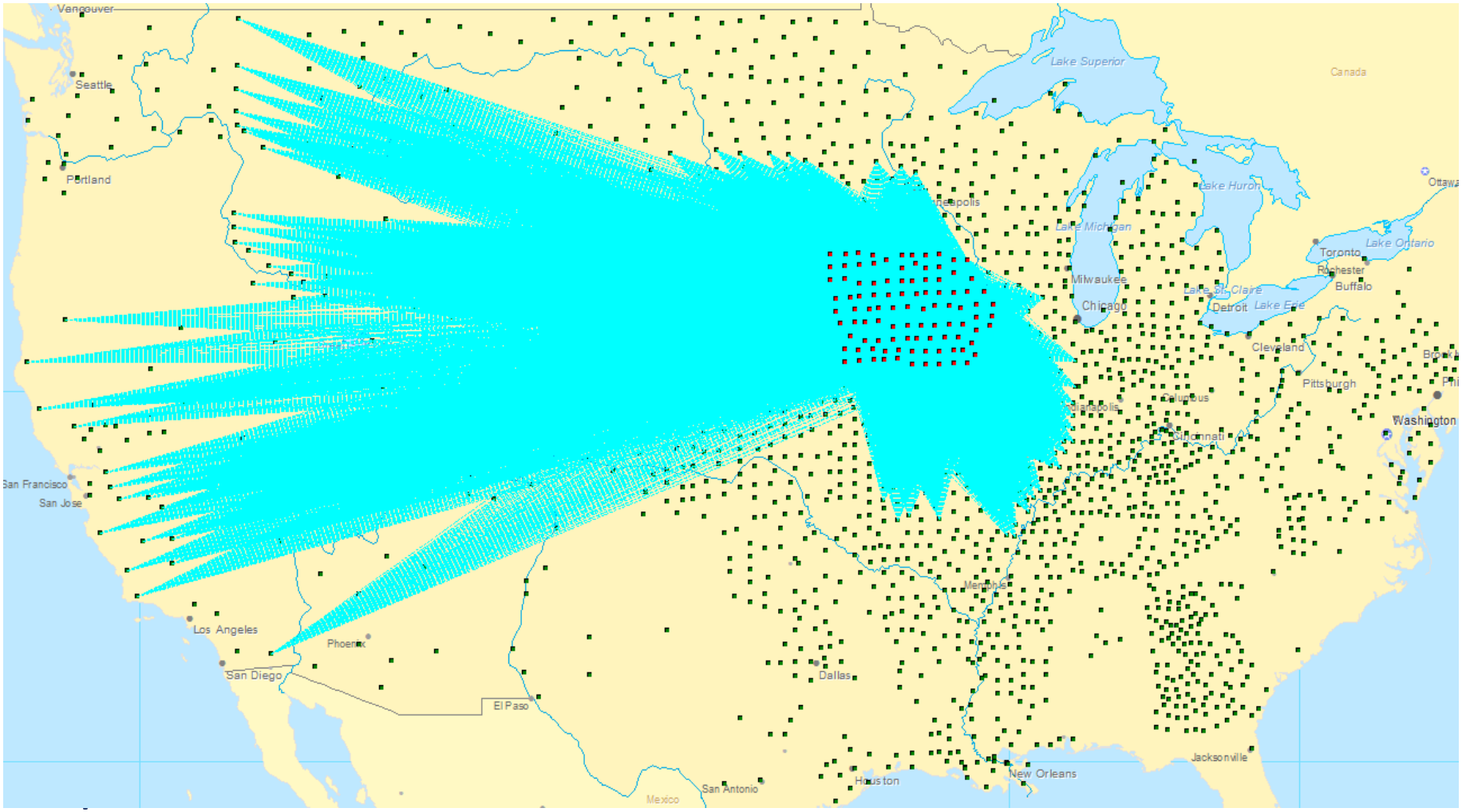
Cereal Grains – Inbound – Truck – Original



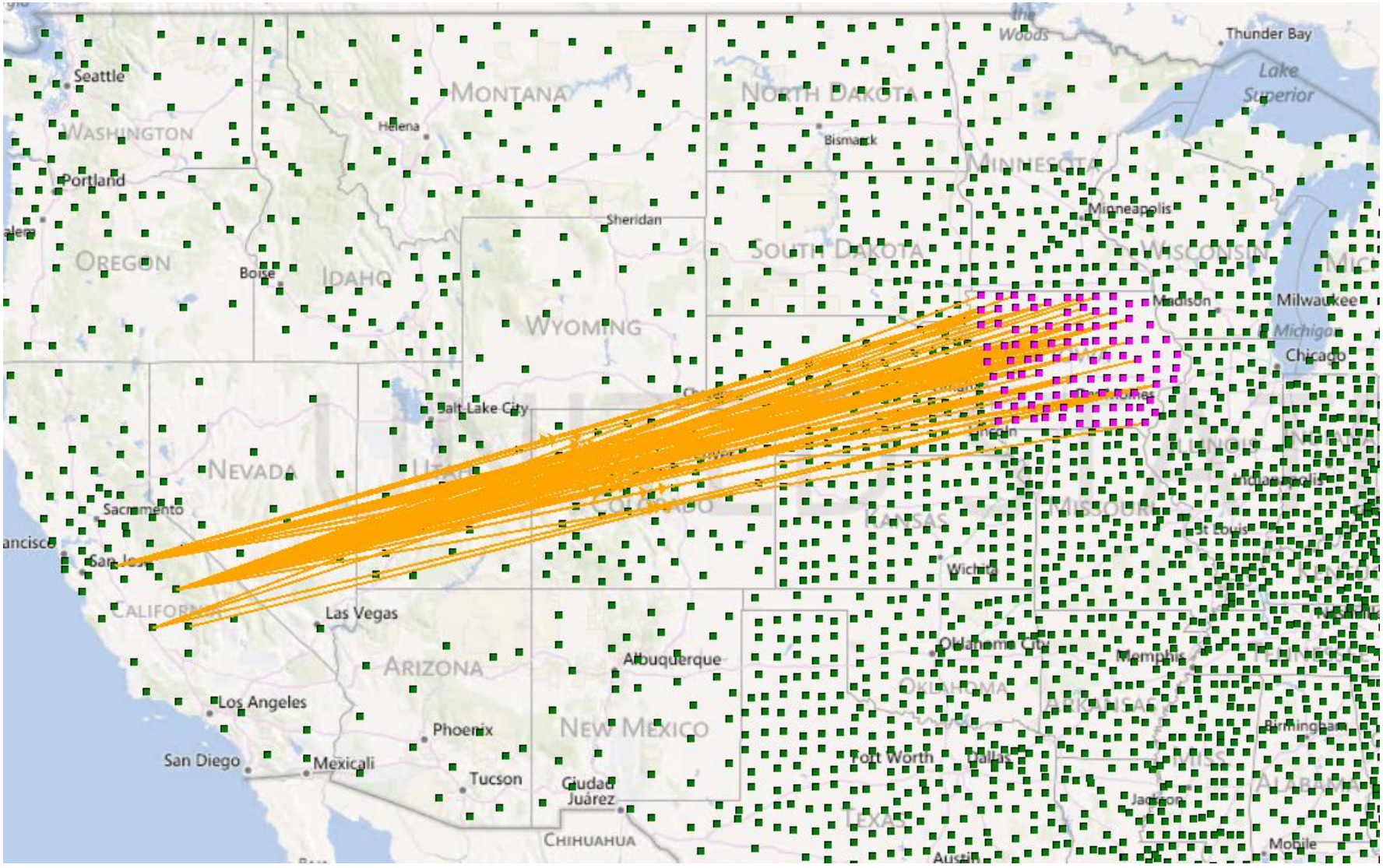
Cereal Grains – Inbound – Truck – Filtered



Cereal Grains – Inbound – Rail – Original



Cereal Grains – Inbound – Rail – Filtered



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Logistics Cost Data

Mode/Type	Description	Data Source
Truckload	Zip3-Zip3 benchmark rates	Transplace Logistics & LLamasoft
Rail	Econometric model based on STB waybill sample	LLamasoft proprietary formula
Intermodal	Hub to hub intermodal benchmark rates	US Rail Desktop & LLamasoft
Ocean	Port to port ocean container tariff	Public tariff of container carrier & LLamasoft
Barge	Point to point benchmark rates	USDA historical rates and 1976 tariff benchmark index
Warehouse	Warehouse construction and operating costs	BizCosts.com distribution warehousing industry report
Handling	Inbound/outbound handling costs	Research/survey

Questions?